

# Horizon Europe Programme

HORIZON-WIDERA-2021-ACCESS-03



TWINNING TO SUSTAINABLE ENERGY TRANSITION

## **WP5: OUTREACH AND SUSTAINABILITY**

*DELIVERABLE 5.3 – FINAL PLAN FOR DISSEMINATION, COMMUNICATION AND EXPLOITATION ACTIVITIES*

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## DOCUMENT INFORMATION

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## CONTENTS

|                                                                                           |    |
|-------------------------------------------------------------------------------------------|----|
| <b>1 INTRODUCTION</b>                                                                     | 8  |
| 1.1 Project overview                                                                      | 8  |
| 1.2 Scope of WP5 Outreach and Sustainability                                              | 8  |
| 1.3 Scope of D5.3 Final Plan for Communication, Dissemination and Exploitation activities | 8  |
| 1.4 Internal communication                                                                | 9  |
| <b>2 Communication, Dissemination and Exploitation Plan (Task 5.1 of proposal)</b>        | 10 |
| 2.1 Target groups                                                                         | 10 |
| 2.2 Messaging                                                                             | 10 |
| <b>3 Communication channels</b>                                                           | 11 |
| 3.1 Visual identity                                                                       | 11 |
| 3.2 Website                                                                               | 12 |
| 3.3 Social media                                                                          | 12 |
| 3.4 Promotional material                                                                  | 12 |
| 3.5 Newsletters                                                                           | 13 |
| 3.6 Press releases & local press/events                                                   | 13 |
| 3.7 Promotional videos                                                                    | 14 |
| 3.8 Workshops with non-academic actors (Task 5.2 of proposal)                             | 14 |
| 3.9 Evaluation of Communication Effectiveness                                             | 16 |
| <b>4 Dissemination channels</b>                                                           | 19 |
| 4.1 Massive Online Open Courses (MOOCs)                                                   | 19 |
| 4.2 One-to-one mentoring/coaching scheme: 5 different topics per year                     | 19 |
| 4.3 Summer schools                                                                        | 19 |
| 4.2 Field visits                                                                          | 20 |
| 4.3 Staff and Student exchanges / expert visits                                           | 22 |
| 4.4 Workshop series on soft skills including project administration and management        | 22 |
| 4.5 Scientific publications                                                               | 24 |
| 4.6 Participation in conferences/events (Task 5.1.1 of proposal)                          | 28 |
| 4.7 Networking activities (Task 5.1.1 of proposal)                                        | 29 |
| 4.8 Final conference (Task 5.5)                                                           | 30 |
| 4.9 Evaluation of Dissemination Effectiveness                                             | 31 |
| <b>5 Exploitation strategy</b>                                                            | 35 |
| 5.1 Identification of Key Exploitable Results (KERs)                                      | 35 |
| 5.2 Intellectual Property and Knowledge Management                                        | 38 |
| 5.3 Results from exploitation activities so far                                           | 38 |
| 5.4 Sustainability and post-project uptake (4-year roadmap)                               | 38 |

|                                                             |           |
|-------------------------------------------------------------|-----------|
| 5.5 Exploring the commercialisation potential of KERs ..... | 40        |
| <b>6 Critical assessment of the CDE outcomes .....</b>      | <b>41</b> |

## ABBREVIATIONS

|                          |                                                                           |
|--------------------------|---------------------------------------------------------------------------|
| <b>UiS</b>               | University of Stavanger                                                   |
| <b>IFPEN</b>             | IFP Energies Nouvelles                                                    |
| <b>IG/FORTH</b>          | Foundation for Research and Technology Hellas /<br>Institute of Geoenergy |
| <b>NCSR “Demokritos”</b> | National Centre for Scientific Research<br>“Demokritos”                   |
| <b>IFE</b>               | Institute for Energy Technology                                           |
| <b>TUC</b>               | Technical University of Crete                                             |
| <b>NTUA</b>              | National Technical University of Athens                                   |
| <b>MOOCs</b>             | Massive Online Open Courses                                               |
| <b>CCS</b>               | Carbon Capture and Storage                                                |
| <b>UHS</b>               | Underground Hydrogen Storage                                              |
| <b>SET</b>               | Sustainable Energy Transition                                             |
| <b>TG</b>                | Target Group                                                              |
| <b>CDE</b>               | Communication, Dissemination and Exploitation                             |
| <b>KPI</b>               | Key Performance Indicator                                                 |
| <b>KER</b>               | Key Exploitable Results                                                   |

## 1 INTRODUCTION

### 1.1 Project overview

EU is facing a pressing challenge to make the transition towards a carbon neutral economy by 2050, with an intermediate target of 55% CO<sub>2</sub> reduction emissions compared to 1990. Greece is lagging in the energy transition process due to several reasons, such as the high share of natural gas in the electricity generation mix on a permanent basis, the use of fossil fuels (lignite) in high-demand periods and a lack of industrial plans to exploit CO<sub>2</sub> capture and storage technologies or the penetration of geothermal energy into the electricity mix.

Geosciences can play a fundamental role in energy transition through technologies that make use of underground resources, such as the geological storage of CO<sub>2</sub> and hydrogen and as a source of geothermal energy. This was the foundation of the TWINN2SET project, a partnership between the Institute of Geoenergy of the Foundation for Research & Technology – Hellas (EL), the University of Stavanger (NO) and the IFP Energies Nouvelles (FR). As a Twinning project, the focus falls onto knowledge exchange, mentoring and capacity building of the widening partner in the domains of a) Carbon Capture and Storage (CCS), b) Deep Geothermal Energy and c) Underground Hydrogen Storage (UHS). Complementary to the educational programme is the research part of the project which will focus on UHS, fostering interdisciplinary competencies at the interplay of a promising energy vector with subsurface reservoir characterisation, modelling, and monitoring. Overall, the TWINN2SET project provided a coherent network that strengthened interactions between members of the consortium and enabled the newly established IG/FORTH to participate in the European R&I process on Energy Transition.

### 1.2 Scope of WP5 Outreach and Sustainability

The objectives of WP5 – Outreach and Sustainability were to achieve the highest possible visibility and impact of the TWINN2SET project through continuous communication and dissemination of project results and to raise awareness at the national and EU level during and beyond the project's lifecycle. WP5 included the development of a Communication, Dissemination and Exploitation (CDE) strategy and monitoring framework of outreach and networking activities; the set-up of an advanced High Pressure-High Temperature Lab facility at IG/FORTH with specifications provided by the advanced partners; the formulation of a common research strategy for the project and beyond.

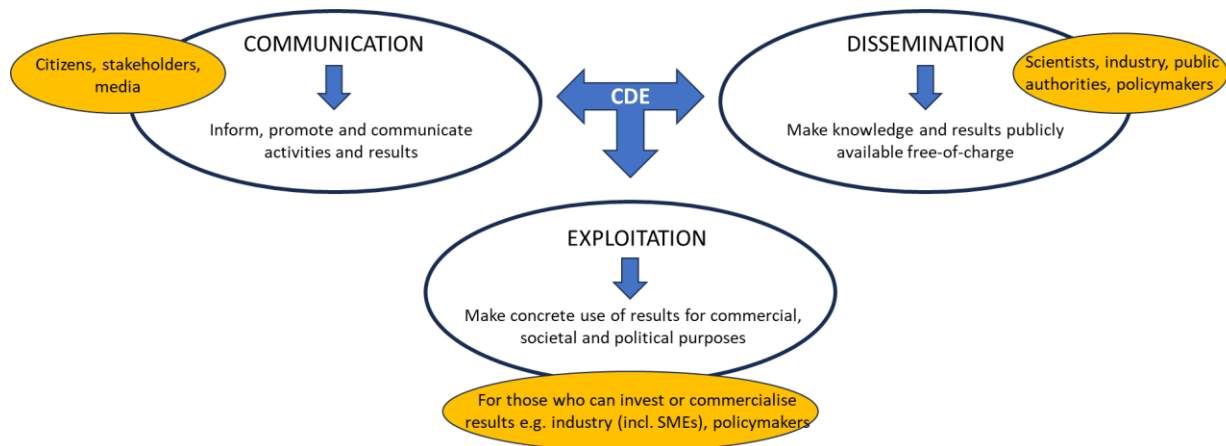
### 1.3 Scope of D5.3 Final Plan for Communication, Dissemination and Exploitation activities

*Task Leader: IG/FORTH; Partners involved: UiS, IFPEN; task duration: M1-M36*

The CDE Plan set the roadmap for the effective implementation of TWINN2SET actions to embrace stakeholders in the project's outcomes and maximize its impact. The plan consisted of three main sectors (Figure 1):

- **Communication** – aimed at raising public awareness on issues related to the energy transition and making the scientific aspect of all related technologies accessible to the non-specialist.
- **Dissemination** – aimed at promoting the project's results to the scientific community and training the next generation of scientists on topics related to sustainable energy transition (SET).
- **Exploitation** – aimed at the promotion of technical knowledge generated through the project to end-users and the potential uptake of produced tools by the industry.

A suite of tools, methods and channels were used to reach the objectives of the Communication, Dissemination and Exploitation Plan, each suited to the specific needs of the target audiences.



**Figure 1.** Sections, objectives and target groups of the Communication, Dissemination and Exploitation Plan.

## 1.4 Internal communication

Internal communication plays a vital role in ensuring an efficient execution of the project to maximize results. It is key to guarantee clear communication among partners and facilitate the exchange of ideas and interaction between work packages.

The members of the consortium had the chance to communicate through:

- **Project meetings:** held annually with physical attendance and virtually. All partners participated and updated the whole consortium on the state of the project and discussed the upcoming steps. Four project meetings have been accomplished with physical attendance, the kick-off meeting in September 2022, the 2<sup>nd</sup> year project meeting in September 2023, the 3<sup>rd</sup> project meeting took place in January 2025 in Athens and the final project meeting in March 2026 all at IG/FORTH premises.
- **Technical meetings:** held in-between project meetings with either physical attendance or online. A technical meeting was held at IFPEN in January 2024 with physical participation. A virtual technical meeting was held in March 2024 with participants from all partners to prepare the project's midterm report. A 3<sup>rd</sup> technical meeting took place virtually in October 2025 "Establishment of a specialized laboratory for the interaction of hydrogen with porous media and surface fluids".

The main tools used by partners for periodic communication was:

- Email: a project mailing list was created. The list included the contact details of all staff involved in the project and identified the contact person from each partner for every work package.
- Teams: this platform was used to host video calls among partners
- Google drive shared folder ([TWINN2SET](#))

The involvement of all partners was key for the successful dissemination of the project and every partner allocated time to dissemination and communication activities. Partners supported dissemination by:

- Making presentations referring to the project/about the project at conferences and other events and shared them within the consortium partners
- Keeping records of all dissemination activities (such as presentations in an event) as those were needed for reporting purposes.
- Using their institution's communication tools to support the dissemination of TWINN2SET (website, newsletters, social media accounts...)
- Linking TWINN2SET 's website to their own websites

- Inviting colleagues/interested parties to sign up for the TWINN2SET 's newsletter and follow the project on social media channels.
- Circulating TWINN2SET's materials (e.g. leaflets, policy briefs, reports) to colleagues/ potential interested parties that were not on the project's mailing list.

## 2 Communication, Dissemination and Exploitation Plan (Task 5.1 of proposal)

### 2.1 Target groups

We identified 6 target groups (TG) that the Communication, Dissemination and Exploitation Plan will reach out to. These were:

**TG1** TWINN2SET scientists and support staff, early-stage researchers, and students

**TG2** The scientific/academic community

**TG3** Heavy-emitting industry

**TG4** Financial actors

**TG5** Policymakers/Governmental bodies

**TG6** Energy Communities

**TG7** Citizens & NGOs

### 2.2 Messaging

**Table 1.** Messages intended for each TG and methods used to achieve their communication.

| TG                                                                                  | Need                                                                                                                                                                                                                                                                                                                                                                                   | Method                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TWINN2SET scientists and support staff, early-stage researchers, and students (TG1) | <p>Building excellence, strengthening of the scientific and innovation capacity of the newly established IG/FORTH.</p> <p>Train the future generation of scientists and future professionals on the skills required by the green economy.</p> <p>Career development of young scientists</p> <p>Strengthen the research management capacities and administrative skills of IG/FORTH</p> | <p>Technical training through MOOCs on energy transition</p> <p>Summer schools &amp; field visits</p> <p>Short-term visits to advanced partners.</p> <p>Joint case studies between IG/FORTH and each of the advanced partners.</p> <p>Organisation of conference at the end of the project.</p> <p>Workshops on soft skills development (gender aspects on energy transition, ethics, RRI, the economy of hydrogen, IPR protection).</p> <p>Workshops on proposal preparation, grants management and IP management.</p> |
| Scientific/academic community (TG2)                                                 | Increase the international visibility of IG/FORTH through networking and building collaborations.                                                                                                                                                                                                                                                                                      | Conference attendance, open-access publications and joint research strategy with advanced partners, networking strategy. Funds allocated for invited speakers at dissemination events.                                                                                                                                                                                                                                                                                                                                  |

|                                        |                                                                                                                                                                                                                                                |                                                                                                                                                                                                                             |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Heavy-emitting industry (TG3)          | Exploration of adoption pathways of CCS, UHS and geothermal energy by heavy emitting industries and interactions between standardisation bodies and investors.                                                                                 | Workshops with major emitting industries requiring to drastically reduce their direct environmental footprint                                                                                                               |
| Financial actors (TG4)                 | Foster dialogue for a common vision on Sustainable Energy Transition (SET) among important actors of society, especially of the Cretan ecosystem, such as policy makers, industries, businesses, financial institutions, NGOs, and the public. | Policy briefs aiming at the inclusion of geothermal energy, UHS and CCS in the national roadmaps as enablers of energy transition.                                                                                          |
| Policymakers/Governmental bodies (TG5) |                                                                                                                                                                                                                                                | Development of a decision-making tool for the relevant authorities/agencies on UHS.                                                                                                                                         |
| Energy communities (TG6)               |                                                                                                                                                                                                                                                | Workshops on citizen engagement by involving energy communities in Crete                                                                                                                                                    |
| Citizens & NGOs (TG7)                  |                                                                                                                                                                                                                                                | Website, social media (Twitter + LinkedIn), YouTube, visual identity and two videos (onset & end of the project), newsletters, factsheets, collaboration with Europe Direct, local press and participation at local events. |

### 3 Communication channels

#### 3.1 Visual identity

**Logo.** A common branding was developed during proposal preparation to ensure an immediate recognition of the project. The logo, as the visual messenger of the project, will be used by all templates, reports, and dissemination activities throughout the project (Figure 2).



Figure 2. TWINN2SET logo

**Dissemination templates.** Templates for Microsoft Word, Microsoft PowerPoint, and Microsoft Excel were developed by IG/FORTH. TWINN2SET partners will use these during the project for presentations, reporting, newsletters, etc. The templates were developed following any applicable rules and regulations of the European Commission.

**Disclaimer.** As included in TWINN2SET's Grant Agreement, all the material used in the Communication and Dissemination of the project must contain the EU Disclaimer (Figure 3). All partners are invited to use the following disclaimer:



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Figure 3. TWINN2SET disclaimer

### 3.2 Website

The website is the main communication and dissemination platform of the project, allowing stakeholders and others to access the project aims, development, and results. It reflects the support of the EU Commission. The TWINN2SET project website is secured within IG/FORTH servers at the following address: <https://twinn2set.ig.forth.gr/>

The homepage of the website presents a few key facts to spark the interest of the visitor and comprises of six sections: Project, Partners, Activities, People, Recruitment and Events/News (Figure 4).

The website gives access to all public deliverables, the bi-annual newsletter and promotes relevant content (news, videos, events) for the key stakeholder groups. It was regularly updated to include the significant flow of research (such as laboratory set-up, experimental work, publications, talks and poster presentations) and milestones.

To increase outreach, the website is directly connected to the project's social media profiles (LinkedIn, Facebook) for a wider dissemination to technical and non-technical audience and linked to all partners websites.

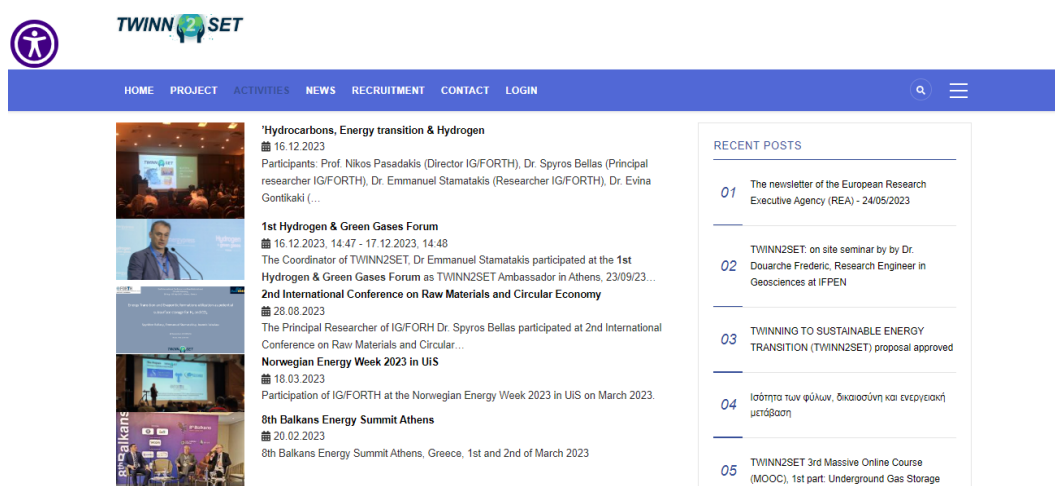


Figure 4. TWINN2SET website.

### 3.3 Social media

News and events relative to the TWINN2SET project were announced at the official accounts of IG/FORTH in Facebook ( <https://www.facebook.com/ig.forth> ) and LinkedIn ( <https://www.linkedin.com/in/institute-of-geoenergy-b18a39254/> ) and the LinkedIn accounts of UiS ( <https://linkedin.com/school/university-of-stavanger/> ) and IFPEN ( <https://www.linkedin.com/school/ifp-school/> ).

### 3.4 Promotional material

The TWINN2SET brochure (Figure 5, left) was developed to raise awareness and increase the project's visibility among the non-specialist community as well as relevant stakeholders. It was distributed to partner organisations for further distribution through their networks and channels and on public events. Paper printouts were kept to a minimum for environmental reasons. A banner was also created for citizen events, exhibitions and summer schools (Figure 5, right).



**Figure 5.** TWINN2SET promotion material (brochure on the left, banner on the right)

### 3.5 Newsletters

An annual newsletter was created to provide updated information about the project to the relevant key stakeholders. The newsletter was sent electronically and uploaded on the project website, and consortium partners shared it via their respective mailing lists.

The objectives of the newsletters were to:

- Increase public awareness regarding Energy Transition
- Increase the project's visibility
- Communicate the project's results and activities to the public
- Increase website traffic
- Collect feedback

The design of the newsletter was in-line with the pre-defined visual identity.

The 1<sup>st</sup> newsletter of TWINN2SET was published during the 1<sup>st</sup> period of the project and is available using the following link: <https://twinn2set.ig.forth.gr/node/237>

Then 2<sup>nd</sup> and 3<sup>rd</sup> newsletters of TWINN2SET were released on July 2024 and on January 2025 respectively and are available online at the following links: <https://twinn2set.ig.forth.gr/node/275> and <https://twinn2set.ig.forth.gr/node/276>.

### 3.6 Press releases & local press/events

Articles in local press were pursued throughout the project. The partners participated also in local exhibition & fairs, Europe Direct events, MSCA and Citizens events (formerly called "Researcher Nights").

Examples of communication in local press and news webpages related to TWINN2SET are listed below:

- Article in local press on the TWINN2SET workshop “Gender aspects of energy transition”. <https://www.haniotika-nea.gr/imerida-institoytoy-geoenergeias-toy-ite-sta-kania/>
- Article in thematic magazine on the TWINN2SET event for the public on the “Social Impact of Energy Transition”. <https://www.thermoydravlikos.gr/stis-3-oktovrioy-sta-kania-i-imerida-toy-ite-gia-tis-koinonikes-epiptoseis-tis-energeiakis-metavasis/>

A featured article (Figure 6) was published in the Innovation News Network and was included in the 16<sup>th</sup> edition of the quarterly publication of the magazine (The Innovation Platform Issue 16, pp 277). <https://www.innovationnewsnetwork.com/twinn2set-twinning-to-sustainable-energy-transition/39883/>



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### TWINN2SET highlights the importance of implementing new technologies to sustainable energy transition pathways.

The need to transition to a carbon neutral economy by 2050 is imperative. A mixture of different technologies are required to achieve a sustainable energy transition pathway and

#### ENERGY STORAGE

#### BATTERY CALORIMETRY

#### BATTERY PRODUCTION

#### BATTERY RECYCLING

#### CANADIAN BATTERY METALS

#### PARTNER NEWS

**5E Advanced Materials launches commercial production at 5E Boron Americas Complex**

3rd April 2024

**Mink Ventures unveils promising assay results from Warren Project**

26th March 2024

**Pulsar Helium receives positive wireline log results for Jetstream #1 appraisal...**

25th March 2024

**University of Arizona**

**Figure 6.** TWINNSET’s article, Inn. News Network, 15/11/23

## 3.7 Promotional videos

Videos from outreach events have been uploaded on IG/FORTH’s YouTube channel:

[www.youtube.com/@instituteofgeoenergy7456](http://www.youtube.com/@instituteofgeoenergy7456)

## 3.8 Workshops with non-academic actors (Task 5.2 of proposal)

Workshops with actors in heavy emitting industries, such as cement production (e.g TITAN) and chemical companies, consumer goods companies as well as oil and gas (e.g MOTOR OIL). These workshops will also host policy makers, targeting awareness raising and stimulation of mutual understanding of the industry challenges underpinning the transition to a green economy.

TWINN2SET co-organised together with TRIĒRĒS project (coordinated by Motor Oil) a workshop on H<sub>2</sub>, CCS & Geothermal Value Chains (Figure 7). The workshop took place in Athens on the 22<sup>nd</sup> of January 2025 where a total of 30 experts and stakeholders across the value chains met together to discuss innovative projects and solutions driving the energy transition.



**Figure 7.** Workshop on H2, CCS & Geothermal value chains co-organised with TRIĒRĒS project.

Additionally, IG/FORTH participated in two 2-day workshop/events with non-academic factors. Dr. Spyros Bellas represented the Institute of Geoenergy, after a formal invitation from the CEO of HEREMA, Dr. Aristofanis Stefatos, participating in closed meetings and discussions with national and EU experts in CCS technology as well as with local stakeholders. In particular, the first workshop titled “Capacity Building Workshop on Carbon Capture Storage” was co-organised between HEREMA, the leading international think tank Global CCS Institute and the Dutch energy company Energie Beheer Nederland (EBN) on 25-26 of September 2024 in Athens, Greece (Figure 8). An affiliated member of IG/FORTH, Vasilis Gaganis, also attended this workshop with a presentation as seen in the workshop agenda (Figure 8).



**Figure 8.** Participation in “Capacity Building Workshop on Carbon Capture Storage”.

The second event titled “5<sup>th</sup> Industrial Carbon Management ICM Forum” was co-organised on 8-9 of December 2025 in Athens, Greece by HEREMA and the European Commission’s Directorate-General for Energy (DG ENER) (Figure 9).



**Figure 9.** Participation in the 2-day event “5<sup>th</sup> Industrial Carbon Management ICM Forum”.

### 3.9 Evaluation of Communication Effectiveness

Table 3 summarises the performance of the communication activities against the targets defined in the original Communication, Dissemination and Exploitation (CDE) Plan and provides a qualitative assessment of their effectiveness. Overall, the communication strategy achieved or exceeded most of the planned objectives and successfully combined complementary communication channels to reach different stakeholder groups.

Rather than relying on a single dissemination pathway, TWINN2SET adopted an integrated communication approach combining digital platforms, printed promotional material, media engagement and face-to-face activities. This combination proved particularly effective in increasing the visibility of both the project and the Institute of Geoenergy (IG/FORTH) while supporting engagement with researchers, industry, policymakers and the wider public.

A notable characteristic of the communication strategy was its close integration with the project's capacity-building and stakeholder-engagement activities. Communication was embedded within Summer Schools, scientific workshops, conferences, field visits and citizen-engagement events, allowing project results to be disseminated alongside training and networking activities. This approach supported knowledge transfer, strengthened the international visibility of IG/FORTH and contributed to the expansion of collaborative networks, outcomes that are reflected in the project's overall impact assessment.

Overall, the communication activities contributed to increasing the visibility of TWINN2SET, strengthening the scientific profile of IG/FORTH and supporting the project's longer-term objective of positioning the Institute as an active contributor to the European sustainable energy transition ecosystem.

**Table 2. Evaluation of communication effectiveness**

| Communication activity                | Planned KPI/ Target                            | Achievement                                                                                                                                                        | Effectiveness assessment                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Website                               | Visits <5 = poor, 5–40 = good, >40 = excellent | Website operational. Regular flow <20 views; announcement periods >60 views; user sessions included 40 views with 30 visits >4–5 minutes.                          | The website successfully served as the project's central information hub and repository for public deliverables, newsletters and project updates. Increased traffic during major dissemination events indicates that the website effectively complemented face-to-face activities and ensured long-term accessibility of project results.                                                                                              |
| Social media                          | LinkedIn & Facebook: 1 post every 2 months     | Facebook page: 551 followers. LinkedIn page: 987 followers, with posts reaching up to 55 likes and multiple reposts/comments from internal and external audiences. | Social media maintained continuous project visibility throughout implementation. LinkedIn proved particularly effective for engaging researchers, industry representatives and professional stakeholders, while Facebook strengthened regional outreach and citizen engagement. The interaction generated by project-related posts suggests that communication extended beyond passive dissemination to active stakeholder engagement. |
| Promotional material                  | 250 brochures                                  | Promotional material designed and used to support dissemination and visibility actions.                                                                            | Printed promotional material complemented digital communication by supporting workshops, conferences, exhibitions and stakeholder meetings. Although its quantitative impact is difficult to assess, it contributed to consistent project branding and visibility during in-person dissemination activities.                                                                                                                           |
| e-Newsletters                         | 2 per year                                     | Three newsletters released: September 2023, July 2024 and January 2025.                                                                                            | The newsletters provided regular updates on project progress and maintained communication with stakeholders throughout the project. Together with the website and social media channels, they contributed to sustained dissemination of project achievements despite relying primarily on digital communication rather than a larger number of newsletter issues.                                                                      |
| Press releases / local press / events | At least 3 per year                            | Three publications in local press/news websites; one thematic-magazine publication; four citizen-engagement events.                                                | Media coverage and public engagement activities successfully broadened dissemination beyond the scientific community, increasing public awareness of sustainable energy technologies and strengthening links with regional stakeholders, citizens and local organisations.                                                                                                                                                             |

|                                    |                                                                                                                    |                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Promotional videos                 | Two videos (midterm and final year), up to 50 views                                                                | Final video under production, earlier communication material supported project visibility.                                                                      |                                                                                                                                                                                                                                                                                                                |
| Workshops with non-academic actors | 2 workshops engaging citizens; 3 workshops with non-academic actors along the CCS, UHS and geothermal value chains | 2/2 citizen-oriented workshops completed; 3/3 workshops with non-academic actors completed. Citizen-engagement actions exceeded the minimum planned activities. | <p>These workshops were among the most effective communication activities, providing direct interaction between researchers, industry representatives, policymakers and citizens.</p> <p>Citizen-engagement event involved over 40 participants</p>                                                            |
| Public engagement                  |                                                                                                                    | Participation of IG/FORTH in 2024 and 2025 Researcher's Night, and the 2025 InnoDays Crete                                                                      | <p>TWINN2SET was promoted in various public events with printed or video material created and updated for each occasion and tailored to the target audience. These events attracted thousands of visitors. Researchers' Night reached &gt;3,000 visitors, InnoDays booth attracted approx. 60–70 visitors.</p> |

## 4 Dissemination channels

### 4.1 Massive Online Open Courses (MOOCs)

MOOCs on energy transition, geothermal systems, subsurface storage (CCS and UHS), and reservoir monitoring were offered by IFPEN's IFP School. This prestigious programme is offered primarily to PhDs and master students of IG/FORTH but participants from collaborating institutions is possible if places are available. Three (3) rounds of MOOCs were foreseen in the project proposal. The 1<sup>st</sup> round was completed successfully in 2023 with the following courses:

- Introduction to energy transition (1 week online)
- Geothermal energy (2 weeks online/on-site)
- Underground gas storage (6 weeks online/on-site)
- Subsurface gas systems (1 week/virtually)
- Reservoir monitoring (1 week/virtually & on-site)

Despite the success of the 1<sup>st</sup> round of MOOCs, it was agreed between partners (and accepted by the PO) that replacing rounds 2 and 3 with more specialised one-to-one mentoring on specific topics of interest would present greater benefits to IG/FORTH students and staff (see section 4.2 below).

### 4.2 One-to-one mentoring/coaching scheme: 5 different topics per year

The one-to-one mentoring/coaching scheme came to replace MOOC rounds 2 and 3 (in 2024 and 2025). IG/FORTH proposed specific topics related to current and future research interests in the institute. Mentoring of involved staff and students was performed virtually.

Potential topics suggested by IG/FORTH for consideration by IFP school are:

- **Biomarkers analysis in sediments and rocks**
- Hydrates phase behavior in CCS operations
- Isotopic analysis of organic mixtures in the subsurface - Gas systems & isotopic characterization
- **Geothermal systems (deep geothermal & hot dry rock)**
- Gold hydrogen (extracting golden hydrogen from depleted oil reserves by adding bacteria)
- LOHC (liquid organic hydrogen carriers) – reversible hydrogenation

Mentoring on two of the topics (shown in red) has been undertaken for “Biomarkers analysis in sediments and rocks” while the one on “Geothermal systems” is ongoing and about to be completed.

### 4.3 Summer schools

Two summer schools were successfully organized in Greece with a vision to engage young scientists in energy transition concepts and technologies with special focus on the role of geological storage in shifting to a carbon free economy. The schools were held in English, in a hybrid format and were open to students, ESRs and the wider academic community in Greece.



**Figure 10.** 1<sup>st</sup> summer school organised by TWINN2SET project (more info: <https://twinn2set.ig.forth.gr/node/274>)

Both summer schools took place in Chania, Greece, at the premises of the Technical University of Crete. The first school was delivered on 1-5 July 2024 (Figure 10) and the second on June 30 to July 4 2025 (Figure 11). The agendas can be found in the following links for the 1<sup>st</sup> summer school (<https://twinn2set.ig.forth.gr/node/272>) and for the second one (<https://twinn2set.ig.forth.gr/node/281>).



**Figure 11.** 2<sup>nd</sup> summer school organized by TWINN2SET project (more info: <https://twinn2set.ig.forth.gr/node/282>)

## 4.2 Field visits

The TWINN2SET training program included 3 field visits which were all completed successfully (Figure 12).



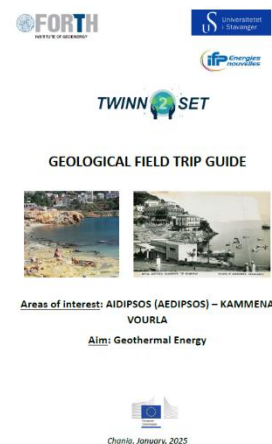
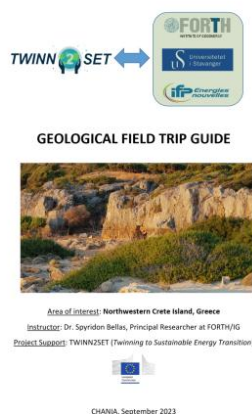
**Figure 12.** Field trips organized by TWINN2SET project

The first geological field trip took place in Chania, Greece on the 27<sup>th</sup> of September 2023 and aimed to increase knowledge of the sub-surface and explore potential reservoir sites ([https://twinn2set.ig.forth.gr/1st\\_Field\\_Trip\\_Chania](https://twinn2set.ig.forth.gr/1st_Field_Trip_Chania)).



The 2<sup>nd</sup> field trip was held at the DMX CO2 capture unit, an IFPEN's industrial pilot plant of the EU-funded project "DMX Demonstration in Dunkirk", in Dunkirk, France on February 1<sup>st</sup> 2024 focusing on CO2 capture technologies from industrial activities (<https://twinn2set.ig.forth.gr/node/252>).

Finally, the 3<sup>rd</sup> field trip took place in Aedipsos, North Euboea Island, Greece, a geothermal area of interest, on January 24 2025 (Figure 13).



**Figure 13.** The field trip guides created by IG/FORTH for the 1st and 3rd field trips (available upon request)

### 4.3 Staff and Student exchanges / expert visits

Staff exchanges between the IG/FORTH and the advanced partners will be taking place every year. Short-term staff exchanges will be available for senior researchers, postdocs, ESRs, PhD students, as well as administrative research support staff. The exchange duration for senior staff members is up to 1 week while ESRs, postdocs, and PhD student visits will range between 2 to 4 weeks.

Two 2-week internships of PhD students from IG/FORTH were conducted, one at UiS (May 2023) and one at IFPEN (July 2023), focusing on underground gas storage and the characterization of hydrogenotrophic microbes respectively. Moreover, a staff exchange between IG/FORTH and IFPEN took place in October 2024 (21-25 October) where a staff member of IG/FORTH travelled to the IFPEN premises for training on GC-IRMS.

A 6-month master internship on environmental microbiology was also offered and took place at IFPEN between February-July 2024 focusing on the characterization of hydrogenotrophic microbial populations in H<sub>2</sub>-rich deep environments using cultivation methods.

Expert staff from IFPEN visited IG/FORTH for the teaching of MOOCs but also for the delivery of on-site seminars/workshops. Also, staff from UiS and IFPEN visited IG/FORTH for project meetings and participated in workshops/seminars and field trips organised during those days.

### 4.4 Workshop series on soft skills including project administration and management.

The series of workshops on soft skills is aimed at the career development of ESRs and students involved in TWINN2SET. These include seminars and workshops on (no. of workshops on each topic in parenthesis):

- Gender aspects (2)
- Open science with focus on the reproducibility of results (2)
- Responsible Research and Innovation (1)
- Ethics (1)
- Hydrogen economy, CCS, and its value chain (1)
- Citizen engagement (3)

The soft skills series includes also workshops on enhancing research management and administration skills:

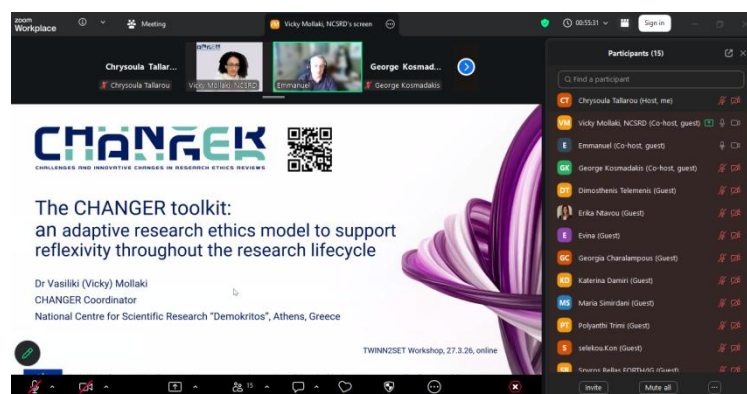
- Project management/administration (1)
- Mapping funding opportunities (3)
- Proposal preparation and time management (1)

All promised workshops on soft skills (7) have been successfully completed. In particular, 2 workshops on “Gender Aspects” were conducted with physical presence in Chania, Grete, Greece (10/2022, 3/2026). Two workshops were organised on “Open Science”, one with physical presence in Stavanger, Norway (3/2023) and one online by IFPEN on March 2026. A workshop on “Responsible Research and Innovation” was given in Chania on June 2025 titled “Synergies for Impact: DESSERT and TWINN2SET projects”, <https://www.dessert-project.eu/synergy-for-impact-workshop-2025/> (Figure 14). TWINN2SET co-organised a workshop with TRIERES project on “Hydrogen economy, CCS and its value chain” in Athens, Greece on January 2025 (Figure 7). Finally, a workshop on “ETHICS BY DESIGN-THE CHANGER TOOLKIT” was given by Dr. Vasiliki Mollaki on March 2026 (Figure 14).

**DESSERT** **TWINN2SET**

**WORKSHOP**  
**SYNERGIES FOR IMPACT: DESSERT & TWINN2SET PROJECTS** MONDAY 30.06.2025  
**AGENDA**

| EEST          | CEST          | AGENDA                                                                  | SPEAKERS                                                                                         |
|---------------|---------------|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 12:00 - 12:05 | 11:00 - 11:05 | WELCOME & INTRODUCTION                                                  | R. Buonfiglio - ENCO srl<br>C. Talarou - IG FORTH                                                |
| 12:05 - 12:10 | 11:05 - 11:10 | ENABLING SAFE HYDROGEN TRANSFER: THE DESSERT PROJECT                    | Victoria Antigarraga - Project Coordinator (TUBACEX INNOVACION)                                  |
| 12:10 - 12:15 | 11:10 - 11:15 | THE TWINN2SET PROJECT                                                   | Dr. Emmanouel Stamatidis - Project Coordinator (Foundation for Research and Technology - Hellas) |
| 12:15 - 12:20 | 11:15 - 11:20 | ROUNDTABLE DISCUSSION: BUILDING CROSS-PROJECT VALUE AND MUTUAL BENEFITS | DESSERT & TWINN2SET                                                                              |
| 12:20 - 12:25 | 11:20 - 11:25 | Q&A SESSION WITH SPEAKERS AND PARTICIPANTS                              | ALL                                                                                              |
| 12:25 - 12:30 | 11:25 - 11:30 | WRAP UP & CONCLUSION                                                    | R. Buonfiglio - ENCO srl<br>C. Talarou - IG FORTH                                                |



**Figure 14.** Workshop agenda on “Responsible Research and Innovation” (left) and snapshot of presentation of the online workshop on “Ethics” (right).

In terms of workshops on “Enhancing Research Management and Administration Skills”, 2 of 3 physical workshops were conducted on “Mapping funding opportunities”, the one at IFPEN premises in Paris, France on January 2024 and the other online on March 2026. Moreover, two workshops were organised with representatives of the advanced partners as expert speakers. The first took place in Chania, on September 2023, where Katrine Peck Lim from the UiS and member of the TWINN2SET’s project steering committee gave a lecture on “Research Management Support” (Figure 15). The second workshop on Intellectual Property was given by Ms Emmanuelle Cecchi from IFPEN on July 2024, in Chania, Crete, Greece (Figure 15).

**4<sup>th</sup> FORTH**  
Institute of Geoenergy

Join us on our 1st Workshop on “Enhancing Research Management and Administration Skills”

organized by the Institute of Geoenergy/FORTH & University of Stavanger  
in the context of the European Project TWINN2SET

**Speakers**

**Katrine Peck Lim**, Research Support Adviser|UIS  
Title : Research Management Support (RSM)

**Dr. Konstantinos Vavekis**, European Patent Attorney|PRAXI Network  
Title : Enhancing Research Management by IPR best strategies

**Tuesday 26 September 2023**

**14:00 EET**

**TUC Building, K2-A1**

Event Agreement 100702018

**TWINN2SET**

**ifp Energies nouvelles**

**AGENDA**

**1-5 July of 2024 | Hybrid (Room K2.A1, University campus, Akrotiri & via zoom)**

The 1st summer school is dedicated to Energy Transition and includes a series of lectures, workshops and lab tours. The event is organized by the Institute of Geoenergy/FORTH in collaboration with the Technical University of Crete within the framework of the EU-funded project TWINN2SET (Twinning to Sustainable Energy Transition).

**Day I**

- 12:00-12:30 Kick start of the 1st Summer School on Energy Transition (FORTH/IG) welcome by Director of FORTH/IG, Prof. Ioannis Genteskakis & the TWINN2SET Coordinator Dr. Emmanouel Stamatidis (Researcher FORTH/IG)
- 12:30-13:00 Keynote Speech on the role of Hydrogen in clean energy transition, Mr. Jorgo Chatzimakakis, CEO Hydrogen Europe (virtual) - “The role of Hydrogen in clean energy transition”
- 13:00-13:30 Mr. Dimitris Triantafillopoulos, CEO Hellenic Hydrogen - “Hellenic Hydrogen - Building a better future with renewable H2”
- 13:30-14:30 Break
- 14:30-17:00 Workshop on Intellectual Property by IFPEN, Ms. Emmanuelle CECCHI IFP Energies nouvelles (France) & Ms. Lorraine LANG IFP Energies nouvelles (France)
- 17:00-18:00 Twinning of the European projects GreenSkills4H2 & TWINN2SET

**Figure 15.** Workshop announcement for the 1<sup>st</sup> workshop on Enhancing Research Management and Administration Skills (left) and agenda of Day 1 of the 1<sup>st</sup> Summer School referring to the second workshop on “Management of Intellectual Properties” (right).

Regarding citizen engagement workshops, IG/FORTH organised an event on 28/9/2023 with support from TWINN2SET. The half-day event included talks and a photography exhibition on the topic “Energy transition and climate change” (Figure 16).



**Figure 16.** Citizen engagement event organised by IG/FORTH

In addition, the TWINN2SET project was actively represented in two more citizen engagement events, the Researchers Night that takes place annually, in the end of September, in FORTH premises in Heraklion (TWINNING represented in 2024 & 2025) and Innovation Days (InnoDays) event which was held on 28-30 of November 2025, both in Heraklion (Figure 17).



**Figure 17.** Participation of TWINN2SET at InnoDays (left) and Researcher's Night (right)

## 4.5 Scientific publications

The partners joined forces to generate scientific publications of high quality. At least 2 training and mentoring activities will take place to foster the skills needed by IG/FORTH staff to achieve high impact publications. Information on indicative subjects and potential publication outlets of high impact factor (IF>3) that will arise from staff exchanges, expert visits etc. is included in the Joint Research Strategy (Task 5.5).

**Table 3.** Peer-reviewed journal publications acknowledging and/or linked to TWINN2SET

| No. | Year | Full reference                                                                                                                                                                                                                                                                                                | Journal / volume                                  | DOI / link                                                                                                  | Main topic / relevance                                           |
|-----|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 1   | 2026 | M. Ghaedi, R. Gholami, S. Bellas, E. Stamatakis. Coupled thermal-hydrodynamic-chemical modeling of calcite scaling in geothermal wells.                                                                                                                                                                       | Geoenergy Science and Engineering, 260            | <a href="https://doi.org/10.1016/j.geoen.2026.214415">https://doi.org/10.1016/j.geoen.2026.214415</a>       | Geothermal systems; scaling; subsurface reactive processes       |
| 2   | 2026 | M. Ghaedi, R. Gholami, S. Bellas, E. Stamatakis. Capillary trapping in CO2 storage sites: A traffic light system for preliminary leakage risk assessment.                                                                                                                                                     | Gas Science and Engineering, 145                  | <a href="https://doi.org/10.1016/j.jgsce.2025.205807">https://doi.org/10.1016/j.jgsce.2025.205807</a>       | CO2 storage; leakage-risk screening; decision support            |
| 3   | 2025 | M. Ghaedi, R. Gholami, S. Bellas, E. Stamatakis. Hydrogen-Brine-Calcite Geochemical Interactions During Underground Hydrogen Storage.                                                                                                                                                                         | Greenhouse Gases: Science and Technology, 0: 1-12 | <a href="https://doi.org/10.1002/ghg.2368">https://doi.org/10.1002/ghg.2368</a>                             | Underground hydrogen storage; geochemical interactions           |
| 4   | 2025 | M. Ghaedi, R. Gholami, S. Bellas, E. Stamatakis. Evaporation-induced salt precipitation and dry-out evolution during hydrogen storage in geological porous media.                                                                                                                                             | International Journal of Hydrogen Energy, 102     | <a href="https://doi.org/10.1016/j.ijhydene.2025.01.141">https://doi.org/10.1016/j.ijhydene.2025.01.141</a> | Hydrogen storage; porous media; dry-out and salt precipitation   |
| 5   | 2025 | P.-M. Trimi, S. Bellas, I. Vakalas, R. Gholami, V. Gaganis, E. Gontikaki, E. Stamatakis, I.V. Yentekakis. A Review of Caprock Integrity in Underground Hydrogen Storage Sites: Implication of Wettability, Interfacial Tension, and Diffusion.                                                                | Hydrogen, 6(4)                                    | <a href="https://doi.org/10.3390/hydrogen6040091">https://doi.org/10.3390/hydrogen6040091</a>               | Caprock integrity; UHS safety; interfacial processes             |
| 6   | 2024 | C. Tallarou, A. Labropoulos, S. Stavropoulos, N. Pasadakis, E. Stamatakis, S. Bellas, R. Gholami, I.V. Yentekakis. A Combined Experimental and Computational Study on the Effect of the Reactor Configuration and Operational Procedures on the Formation, Growth and Dissociation of Carbon Dioxide Hydrate. | Sustainability, 16(20)                            | <a href="https://doi.org/10.3390/su16208854">https://doi.org/10.3390/su16208854</a>                         | CO2 hydrate formation; experimental and computational methods    |
| 7   | 2023 | Nikolaos Chalkiadakis, Emmanuel Stamatakis, Melina Varvayanni, Athanasios Stubos, Georgios Tzamalīs and Theocharis Tsoutsos. A New Path towards Sustainable Energy Transition: Techno-Economic Feasibility of a                                                                                               | Energies, 16(17), 6257                            | <a href="https://doi.org/10.3390/en16176257">https://doi.org/10.3390/en16176257</a>                         | Energy transition; hydrogen systems; techno-economic feasibility |

| No. | Year | Full reference                                                         | Journal / volume | DOI / link | Main topic / relevance |
|-----|------|------------------------------------------------------------------------|------------------|------------|------------------------|
|     |      | Complete Hybrid Small Modular Reactor/Hydrogen (SMR/H2) Energy System. |                  |            |                        |

In addition, there are 3 submitted manuscripts under review, 2 of there have been accepted and three more that are currently under preparation. Under review manuscripts are listed below:

**Table 4:** Submitted and upcoming manuscripts acknowledging TWINN2SET

| No. | Status            | Reference / working title                                                                                                                                                                                                                                                | Target journal / year                          | Main topic / relevance                                                 |
|-----|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------|
| 1   | Submitted         | M. Ghaedi, R. Gholami, S. Bellas, E. Stamatakis. Analytical Estimation of CO2 Plume Propagating During Underground Storage in Saline Aquifers. (28.2.2026)                                                                                                               | 2026                                           | CO2 storage; plume propagation; saline aquifers                        |
| 2   | Accepted          | Veronika Abdulina, Spyridon Bellas, Tina Puntervold, Skule Strand, Dimosthenis Telemenis, and Aleksandr Mamonov, "Petrophysical Controls on Fluid Storage and Wettability in Cenozoic Diatomites from Norway and Greece".                                                | Geoenergy Science and Engineering, 2026        | Diatomites, petrophysical control, fluid storage, wettability          |
| 3   | Accepted          | R. Gholami, S. Ahmadpour, M. Ghaedi, S. Bellas, E. Stamatakis. Onset and Dynamics of Density-Driven Convection in Underground Hydrogen Storage Sites. (10.3.2026)                                                                                                        | International Journal of Hydrogen Energy, 2026 | UHS; density-driven convection; reservoir behaviour                    |
| 4   | Under preparation | A. Raftogianni, P. Trimi, S. Bellas, I. Vakalas, V. Gaganis, D. Hosein, A. Mathilde, E. Stamatakis, A. Stubos, L. Hebrard. Thermodynamic Modeling and Wellbore Phase Transition in the Milos Geothermal Reservoir: Comparison of Black-Oil and Compositional Approaches. | Energies, 2026                                 | Geothermal systems; thermodynamic modelling; wellbore phase transition |

| No. | Status            | Reference / working title                                                                                                                                                                                                                                             | Target journal / year | Main topic / relevance                                  |
|-----|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------|
| 5   | Under preparation | S. Bellas, D. Diplas, P.-M. Trimi, E.M. Kanakaki, E. Stamatakis and V. Gaganis. A decision-making tool for the selection of potential hydrogen storage geological sites (the salt caverns case).                                                                      | Energies, 2026        | Decision-support tool; salt caverns; UHS site selection |
| 6   | Under preparation | E. Gontikaki, E. Maragkozioglou, E. Muller, S. Poirier, S. Bellas, I. Y Gentekakis, E. Stamatakis. Combined effects of temperature and salinity on hydrogen consumption by Methanobacterium formicicum: expanded optima and implications for Underground Gas Storage. | TBA                   | Growth data on Methanobacterium formicicum              |

## 4.6 Participation in conferences/events (Task 5.1.1 of proposal)

Important conferences in scientific areas of the project are an important medium to promote the visibility of IG/FORTH in Europe and beyond. Important conferences will be identified by M3 of the project with the aim of participating with joint contributions between partners. Conference and events that have been identified at the beginning of the project are the EU energy week, Hydrogen Review days, CCUS combined with H2 European Technology EXPO and EGECC Geothermal, and the European Geothermal Congress.

All partners are encouraged to present TWINN2SET at external events to increase the impact of the project. The coordinator must be always informed before and about the planned presentations and their content. When necessary, to ensure accuracy and consistency, the presentation content will be developed in cooperation with the coordinator.

So far, the TWINN2SET project has been promoted in the following conferences/events:

- 13<sup>th</sup> FORTH Retreat 2022, 15-16 July 2022, Heraklion, Crete, Greece
- 8th Balkans Energy Summit, 1-2 March 2023, Athens, Greece
- Energy Norway, 13-15 March 2023, Stavanger, Norway
- 1<sup>st</sup> Hydrogen & Green Gases Forum, 23<sup>rd</sup> June 2023, Athens, Greece
- Day event organised by PROMEA (<https://hydrogen.promea.gr/>), 11<sup>th</sup> July 2023, Athens, Greece
- Online workshop on HOW TO PREPARE A SUCCESSFUL PROPOSAL FOR WIDENING ACTIONS (TWINNING AND HOP-ON), 21st July 2023
- 2nd International Conf. on Raw Materials and Circular Economy, 28 Aug-02 Sep 2023, Athens, Greece
- EFC23 European Fuel Cell and Hydrogen 2023, September 13th - 15th 2023, Capri, Italy
- Hydrogen Conference 2023, 28<sup>th</sup> November 2023, Athens, Greece
- "Hydrocarbons, energy transition, hydrogen-Crete as energy hub", 16-17 December 2023, Heraklion, Crete, Greece
- Energy Norway, 15-17 April 2024, Stavanger, Norway
- **Researchers Night 2024, 27<sup>th</sup> September 2024, Heraklion, Crete, Greece**
- The 14th Panhellenic Scientific Conference on Chemical Engineering, 29-31 May 2024, Thessaloniki, Greece
- 14<sup>th</sup> FORTH Retreat, 11-13 October 2024, Archaia Olympia, Greece
- French-Hellenic Defense Innovation Symposium, 12-13 December 2024, Athens, Greece
- 9<sup>th</sup> Balkans Energy Summit, 29-30 April 2025, Athens, Greece
- 7th International Conference on Fault and Top Seals, European Association of Geoscientists & Engineers, 15-18 September 2025, Bucharest, Romania
- Joint Conference of The MicroBioKosmos Society & the Central and Eastern Europe Symposium on Microbial Ecology (CEESME) 2025, 22-24 September 2025, Thessaloniki, Greece
- **Researchers Night 2025, 26<sup>th</sup> September 2025, Heraklion, Crete, Greece**
- Premier Natural Hydrogen Worldwide Summit, 13-14 November 2025, Paris, France
- **Innovation Days (InnoDays) 2025, 28-30 November 2025, Heraklion, Crete, Greece**

**Table 5.** Conference abstracts, oral and poster outputs

| No. | Year | Type                       | Reference / event                                                                                                                                                                                                                                                                                                                                                                     |
|-----|------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 2026 | Conference abstract / oral | A. Labropoulos, S. Bellas, C. Drosou, A. Sideridis, P. Koutsovitis, E. Stamatakis, N. Kostoglou, D. Gournis, I.V. Yentekakis. High-Pressure CO <sub>2</sub> Adsorption and Mineralogical Evaluation of Sandstones from the Mesohellenic Trough (Greece) for Geological Carbon Storage. 15th Panhellenic Scientific Conference of Chemical Engineering, 3-5 June 2026, Chania, Greece. |
| 2   | 2024 | Conference abstract / oral | E. Stamatakis, A. Labropoulos, C. Tallarou, S. Stavropoulos, S. Bellas, N. Pasadakis, I. Yentekakis. Effect of the Reactor Configuration and Operational Parameters on Formation, Growth and Dissociation of Carbon Dioxide Hydrate. 14th FORTH Retreat, 11-13 October 2024, Ancient Olympia, Greece.                                                                                 |

| No. | Year | Type                         | Reference / event                                                                                                                                                                                                                                                                                                         |
|-----|------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3   | 2024 | Conference abstract          | C. Tallarou, S. Stavropoulos, A. Labropoulos, S. Bellas, E. Stamatakis, N. Pasadakis, I. Yentekakis. A combined experimental and computational study on CO <sub>2</sub> hydrate formation, growth and dissociation. 14th Panhellenic Scientific Conference of Chemical Engineering, 29-31 May 2024, Thessaloniki, Greece. |
| 4   | 2024 | Conference abstract / poster | Bellas S., Telemenis D., Manoutsoglou E., Yentekakis I. Hydrocarbon Generation Potential of the Diatomites, Western Crete, Greece. 14th FORTH Retreat, 11-13 October 2024, Ancient Olympia, Greece.                                                                                                                       |
| 5   | 2024 | Conference abstract / poster | E. Maragkozioglou, E. Gontikaki, S. Bellas, E. Stamatakis, I. Yentekakis, S. Poirier. Subsurface microbial hydrogen cycling: implications for Underground Hydrogen Storage projects. 14th FORTH Retreat, 11-13 October 2024, Ancient Olympia, Greece.                                                                     |
| 6   | 2023 | Conference abstract / oral   | Bellas, S., E. Stamatakis, I. Vakalas. Energy Transition and Evaporitic formations utilization as potential subsurface storage for H <sub>2</sub> and CO <sub>2</sub> . 2 <sup>nd</sup> International Conference on Raw Materials and Circular Economy (RawMat2023), 28 Aug.-02 Sept. 2023, Athens, Greece.               |
| 7   | 2025 | Conference abstract/poster   | E. Maragkozioglou, S. Poirier, S. Bellas, E. Stamatakis, I. Yentekakis, E. Gontikaki. Subsurface microbial hydrogen cycling: implications for Underground Hydrogen Storage projects, 22-24 September 2025, Thessaloniki, Greece                                                                                           |
| 8   | 2026 | Conference abstract/poster   | S. Bellas, P. Trimi, I. Vakalas, E. Gontikaki, E. Stamatakis. <a href="#">Natural Hydrogen Perspectives in Greece</a> . H-Nat Summit 2025, Online/Paris, France. 2025                                                                                                                                                     |

#### 4.7 Networking activities (Task 5.1.1 of proposal)

IG/FORTH will explore membership opportunities in the European Clean Hydrogen Alliance, the Hydrogen Technology Collaboration Programme (Hydrogen TCP) of the International Energy Agency, the International Geothermal Alliance, and European Geothermal Energy Council and (at national level) in the Greek Hydrogen Association (under establishment) or other suitable groups that will be deemed appropriate for boosting visibility and enhance networking opportunities. In this context, IG/FORTH, represented by Prof. Ioannis Yentekakis (director) and Emmanuel Stamatakis (TWINN2SET coordinator), joint the Cretan Hydrogen Association, established on the 8<sup>th</sup> of July 2025. Moreover, IG/FORTH follows Task 42 of IEA regarding Natural Hydrogen.

TWINN2SET is also seeking networking opportunities with other EU-funded projects. So far, we have aligned with the Twinning project EPIBOOST (Advancing Epigenetics Research) and presented the scope of TWINN2SET through a webinar in July 2023 (Figure 18). TWINN2SET has also developed a synergy with EU-funded project DESSERT which unites 6 partners from four EU countries focusing on designing and validation an advanced production string for hydrogen storage (<https://ig.forth.gr/node/859>). In addition, TWINN2SET project has a MoU with the Green Skills for Hydrogen (GreenSkillsforH<sub>2</sub>) project coordinated by CluBE.



**Figure 18.** Presentation of IG/FORTH in the context of TWINN2SET project during the EPIBOOST webinar.

**Table 6.** Bilateral meetings held so far to promote TWINN2SET to stakeholders.

| Date / Place                | Participants                                                                                                                                               | Meeting scope & outcome                                                                                                                                                                                             |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10/3/2023<br>(Oslo, Norway) | Jiri Muller (Special Advisor, IFE)<br>Emmanuel Stamatakis (IG/FORTH)                                                                                       | Bilateral meeting to communicate TWINN2SET scope & objectives and to discuss potential synergies between the 2 Institutions; Dr. Jiri Muller also accepted the invitation to join the Advisor Board of the project. |
| 24/3/2023<br>(telco)        | Giorgos Kalantzopoulos, Sissel Opsahl Viig, Mario Silva (IFE, Norway) & Nikos Pasadakis, Emmanuel Stamatakis, Spyros Bellas, Evina Gontikaki (IG/FORTH)    | Follow-up meeting to further exploit synergies between IG/FORTH & IFE in TWINN2SET-related topics.                                                                                                                  |
| 27/3/2023<br>(telco)        | Juan Soto (Bureau of Economic Geology, The University of Texas at Austin, USA & Granada University, Spain) & Emmanuel Stamatakis, Spyros Bellas (IG/FORTH) | Bilateral meeting to discuss opportunities for collaboration and knowledge transfer on salt bodies tectonics relevant to potential locations for Hydrogen Storage in Greece.                                        |

#### 4.8 Final conference (Task 5.5).

A one-day short conference on “Geoenergy and Energy Transition” was organised towards the end of the project, on the 19<sup>th</sup> of March 2026 in Chania, Greece. The conference focused on the achievements of the project, in scientific advancements and impact for IG/FORTH including knowledge transfer achieved for staff and ESRs through dissemination activities and a round table on Geoenergy transition (Figure 19).



**Figure 19.** Final conference on “Geoenergy and Energy Transition (<https://www.ig.forth.gr/node/862>).

## 4.9 Evaluation of Dissemination Effectiveness

Dissemination activities successfully exceeded their primary objective of transferring scientific knowledge and strengthening institutional capacity. Rather than functioning as isolated activities, training, networking, mobility and scientific dissemination reinforced one another, creating a coherent capacity-building programme that generated lasting collaborations, scientific outputs and follow-up research initiatives. The adaptation of selected activities during implementation (e.g. replacement of repeated MOOCs by one-to-one mentoring) further demonstrated the consortium's ability to respond to emerging needs while maintaining the original objectives of the project. The six-month Master's internship on subsurface microbiology at IFPEN proved to be one of the project's most effective capacity-building actions. IG/FORTH coordinated the advertisement and selection of the successful candidate, while the internship provided intensive training in specialised methodologies unavailable locally. Knowledge transfer continued after completion of the internship through the trainee's return to IG/FORTH, contributing to the dissemination of newly acquired expertise within the Institute.

Field visits complemented the theoretical training programme by exposing participants to geological formations and industrial facilities directly relevant to CCS, underground hydrogen storage and geothermal energy. To maximise their long-term educational value, IG/FORTH developed a comprehensive field guide on the geology of northwestern Crete, which remains publicly available as a project legacy. The visit to IFPEN's DMX CO<sub>2</sub> capture pilot plant provided first-hand exposure to industrial carbon capture technologies, while the geothermal field visit to Aedipsos was complemented by water sampling for microbiological analyses, leading to ongoing scientific work.

Networking activities further enhanced the impact of the dissemination programme. Participation in professional associations, the establishment of synergies with other Horizon Europe projects through joint workshops and events, and the signing of Memoranda of Understanding expanded the project's collaborative network beyond the consortium. These activities increased the visibility of TWINN2SET, facilitated knowledge conferecollaborations and future European research initiatives.

**Table 7.** Dissemination Performance Assessment

| Dissemination Activity | Planned KPI / Target                                                            | Achievement                                                                                                                                                  | Effectiveness Assessment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------|---------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MOOCs                  | One 11-week programme                                                           | Completed successfully<br><br>11 <sup>th</sup> week program (November-June 2023) on topics relevant to Energy Transition                                     | The programme established a common scientific foundation in energy-transition technologies and successfully transferred specialised knowledge to early-career researchers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| One-to-one mentoring   | ≥5 topics of mentoring in replacement of MOOCs in years 2 and 3 of the project. | Five priority topics agreed between partners.<br><br>2 of them was undertaken (Biomarkers and Geothermal coaching), 1 is still ongoing (geothermal coaching) | The adapted mentoring scheme provided more targeted support aligned with the research priorities of IG/FORTH and enhanced individual knowledge transfer compared with repeated general training courses. The first round of the MOOCs and coaching activities has been completed. The geothermal coaching has been agreed to continue beyond the project's completion through the partners IG and FORTH, using their own resources. Furthermore, a joint scientific publication is currently under preparation.                                                                                                                                                                                                                                                            |
| Summer Schools         | 2 schools (>50 participants/year)                                               | 2 hybrid summer schools in 2024 & 2025, attracting 73 and 44 participants, respectively.                                                                     | The Summer Schools successfully combined specialised scientific training with networking and interdisciplinary exchange, strengthening the visibility of IG/FORTH and fostering interaction among researchers from different institutions. The high participation rates, diverse participant profiles and career stages, and positive feedback confirmed the value of this format as an effective capacity-building activity. The feedback was overall positive and most respondents expressed a high level of satisfaction with the Summer School, both for workshops and lectures. The participants were from different academic backgrounds and career stages, including Master's students, PhD candidates, post-docs, employees at the private sectors and Professors. |

|                                                               |                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Field visits                                                  | 3                                                                                                                                                                                                                            | 3 completed                                                                                                                                                                                                                                                                                                                                                                                                     | Field visits complemented classroom training by exposing participants to industrial facilities and geological sites, facilitating practical understanding of subsurface energy technologies. The 2 comprehensive geological field guides produced for both field trips in Greece will be used by IG/FORTH as educational material in future summer schools or citizen science projects co-organised with regional authorities in Greece.                                                                                                                                                                                                                                 |
| Staff exchanges                                               | Short-term visits of IG/FORTH staff to UiS and IFPEN; senior and ESR exchange units foreseen annually; 6-month internship to IFPEN                                                                                           | Senior staff exchange units: 6. ESR exchange units: 5. Additional technical/admin and advanced-partner visits supported training, project meetings and field/lab activities; 6-month internship at IFPEN completed 60 short-term visits of IG/FORTH staff to UiS and IFPEN (includes project/technical meetings and field trips)<br>Total senior units per year = 5 units<br>Total ESRs units per year= 5 units | Staff exchanges, including the 6-month internship, were among the most effective capacity-building activities, providing direct exposure to advanced facilities, methodologies and research environments while strengthening long-term institutional collaboration. The staff exchanges were not confined to merely training purposes but also served as platforms for the generation of novel scientific data which are included in peer-reviewed publications stemming from the project. Trainees were, therefore, exposed to the whole process of scientific publishing, from field/experimental collection of data to data-processing and publication-ready outputs. |
| Soft-skills & Project management and administration workshops | 2 of 2 workshops on Gender aspects<br>4 of 3 workshops on Citizen engagement<br>2 of 2 in Open Science<br>1 of 1 workshop on Responsible Research and Innovation<br>1 of 1 workshop on Hydrogen economy, CCS and value chain | Target achieved                                                                                                                                                                                                                                                                                                                                                                                                 | The workshops broadened researchers' competencies beyond technical expertise by strengthening proposal writing, research management, ethics, gender awareness and open science practices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

|                                 |                                                                                                                                        |                                                                                              |                                                                                                                                                                                                                                                                                            |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | 1 of 1 workshop on Ethics<br>2 of 3 workshops on Funding opportunities<br>2 of 2 workshops on IPR management<br>entrepreneurial issues |                                                                                              |                                                                                                                                                                                                                                                                                            |
| Scientific publications         | 6 joint publications foreseen throughout the project at journals with IF >3.                                                           | 7 peer-reviewed journal publications and 4 additional submitted or in preparation.           | The publication output exceeded the original target and demonstrated that the project's dissemination activities successfully translated into high-quality scientific outputs and durable research collaborations that will continue beyond the project lifetime.                          |
| Conferences / Networking events | 3 conferences (1 conference/year for 1 person) for IG/FORTH; 1 conference for UiS                                                      | 6 scientific + 6 hydrogen events                                                             | Oral and poster presentations significantly increased the international visibility of IG/FORTH and facilitated scientific networking with leading European research and innovation communities. Participation in networking events also supported the establishment of new collaborations. |
| Final conference                | One-day conference on M35                                                                                                              | Completed successfully with 67 registrations and over 50 participants (in-person and online) | The final conference effectively consolidated project achievements, facilitated stakeholder dialogue and provided a platform for discussing future collaboration opportunities.                                                                                                            |

## 5 Exploitation strategy

Unlike technology-development projects, TWINN2SET was implemented as a Horizon Europe Twinning Coordination and Support Action (CSA), with its primary objective being the strengthening of research excellence, institutional capacity and international collaboration rather than the commercial development of products or services. Consequently, exploitation within TWINN2SET focused primarily on the uptake and long-term use of project results through knowledge transfer, scientific collaboration, development of research infrastructure, stakeholder engagement and preparation of follow-up research and innovation activities. Nevertheless, the project generated several exploitable outcomes extending beyond scientific publications and training activities. These include the establishment of new research infrastructure, development of a decision-support tool for preliminary geological hydrogen storage assessment, strengthened European research networks and durable collaborations that provide a foundation for future scientific, technical and commercial opportunities.

### 5.1 Identification of Key Exploitable Results (KERs)

A key exploitable result is anything having a commercial or social significance (i.e., providing knowledge or economic profit). This could be a patent, consultancy services, licenses, knowhow, publications etc. Identified KERs stemming from TWINN2SET are listed below (Table 4)

**Table 8.** Identified KERs stemming from TWINN2SET

| Key Exploitable Result (KER)                                         | Description                                                                                                                                                                                                        | Owner(s)             | Target users / beneficiaries                                                                                            | Exploitation pathway & sustainability                                                                                                                                                           |
|----------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Decision-support tool for geological hydrogen storage site screening | An integrated geochemical/ mineralogical, bio-geochemical, and thermodynamic numerical simulation software/model for the identification, evaluation and ranking of suitable geological sites for hydrogen storage. | IG/FORTH             | Public authorities, enterprises, associations, energy service companies (ESCOs), academic/research organizations, funds | Further development through collaborative research, consultancy services, the wider Advance D&E Academy, and future Horizon Europe projects. Potential service for preliminary site assessment. |
| High-Temperature High-Pressure (HTHP) laboratory                     | Experimental infrastructure for investigating rock–fluid interactions and subsurface processes relevant to CCS, underground hydrogen storage and geothermal energy.                                                | IG/FORTH             | Academic researchers, research organisations, industry partners, postgraduate students                                  | Permanent research infrastructure supporting collaborative research, contract research, specialised analytical services, researcher training and proposal development.                          |
| Integrated research methodologies and protocols                      | Methodologies developed through joint research on geological hydrogen storage, reservoir characterisation, geomodelling, microbiology, geochemistry and                                                            | IG/FORTH, UiS, IFPEN | Research organisations, universities, geological surveys                                                                | Continued application in collaborative research, scientific publications, researcher training and future research proposals.                                                                    |

|                                           |                                                                                                                                                                                                             |                      |                                                                                      |                                                                                                                                                                                                                                                                       |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                           | experimental workflows.                                                                                                                                                                                     |                      |                                                                                      |                                                                                                                                                                                                                                                                       |
| Capacity-building and training framework  | Training programme of Summer Schools and educational resources developed through mentoring, field guides, workshops and educational resources developed during the project.                                 | IG/FORTH, UiS, IFPEN | Early-career researchers, postgraduate students, universities, research institutions | Reuse in future training activities, postgraduate education, and professional development courses (e.g., MOOCs specifically developed by IFPEN for TWINN2SET).                                                                                                        |
| European research and stakeholder network | Long-term collaborative network established among research organisations, industry, policymakers and European initiatives through staff exchanges, workshops, conferences, MoUs and stakeholder engagement. | Consortium           | Consortium partners, European research community, industry, policymakers             | Network sustained through follow-up proposals (e.g. the OPHyURE proposal submitted under the HORIZON-JU-CLEANH2-2025-01-07 call), scientific collaborations, stakeholder engagement and participation in European research networks (e.g. Green Skills for Hydrogen). |

## 5.2 Intellectual Property and Knowledge Management

Knowledge generated during the project was managed in accordance with the Horizon Europe Grant Agreement, the Consortium Agreement and the project's Data Management Plan. Ownership of project results remained with the generating beneficiary unless jointly developed, in which case ownership was managed according to the provisions agreed within the consortium. Public deliverables, scientific publications and educational material were disseminated through open-access principles whenever possible, ensuring broad accessibility while respecting intellectual property rights and confidentiality obligations.

Although no patent applications or formal intellectual property protection measures were pursued during the project, several project outcomes—including the decision-support tool for geological hydrogen storage site screening and the experimental protocols developed within the HPHT laboratory—represent valuable know-how that will continue to be further developed through collaborative research, consultancy activities and future European projects.

## 5.3 Results from exploitation activities so far

The major outcomes of the stakeholder's involvement & consultation so far are the following:

- The **development of joint research proposals** namely the **DeepSEA** between UiS/FORTH/TUG under the Clean Hydrogen Partnership 2024 call and the **OPHyURE** proposal (UiS/FORTH as consortium partners) submitted under the HORIZON-JU-CLEANH2-2025-01-07 call.
- The **cooperation between IG/FORTH & NCSR**D regarding Hydrogen Storage Underground. As a result, an advanced core flooding experimental equipment has been made available by NCSR D to the TWINN2SET project. This equipment has been already installed at IG/FORTH premises and is fully operated.
- The **cooperation between IG/FORTH and the Region of Western Macedonia** on a **new demo project** funded by the regional funds in order to study potential geological formations for hydrogen storage in the region. The Region of Western Macedonia is a Region under Transition and large hydrogen projects are being designed that will create a huge demand for hydrogen storage.
- The **collaboration between IG/FORTH & CLUBE** (*Cluster of Bioeconomy & Environment of Western Macedonia*), as well as between **TWINN2SET & H2SKILLS** (*Green Skills for Hydrogen*) projects for the parallel organisation of their Summer Schools during 1-5 of June 2024. There will be a live interface between the 2 Summer Schools with targeted common presentations.
- The **participation of IG/FORTH in a new HORIZON EUROPE project (TRIERES)** after the invitation by MOTOR OIL (TRIERES Coordinator), following the successful exploitation actions of TWINN2SET. The TRIERES project aims to develop a small Hydrogen Valley in Korinthos, the first hydrogen ecosystem in Greece.
- The **participation of IG/FORTH as a sub-contractor of NCSR D in a new project (CALIPSO)** funded by the European Defence Agency (EDA) on hydrogen safety aspects.
- The **participation of the Coordinator, Dr. Emmanuel Stamatakis, as Non-Governmental Greek Expert** for the Energy and Environment (EnE) CapTech of the EUROPEAN DEFENCE AGENCY (EDA).
- The **participation of the Coordinator, Dr. Emmanuel Stamatakis** at the Technical Committee 2 (Hydrogen storage, transport & distribution) of the HYDROGEN EUROPE RESEARCH – CLEAN HYDROGEN PARTNERSHIP.
- The **participation of TWINN2SET WP4 Leader, Dr. Spyros (Spyridon) Bellas** at the Technical Committee for Conducting an International Evaluation Competition of the Hellenic Hydrocarbons and Energy Resources Management Company (HEREMA S.A.) relevant to the Project “DEVELOPMENT OF A CARBON CAPTURE AND STORAGE FACILITY”

## 5.4 Sustainability and post-project uptake (4-year roadmap)

The long-term sustainability of TWINN2SET is founded on the continuation of the scientific collaborations, research infrastructure and stakeholder networks established during the project rather than on the completion of individual dissemination activities. Institutionally, the establishment of the HPHT laboratory has significantly strengthened the research capacity of IG/FORTH and provides a permanent platform for future experimental research on geological

hydrogen storage, geothermal systems and carbon capture and storage. The laboratory will continue supporting collaborative research, postgraduate education and participation in European and national funding programmes. Scientifically, the project has established durable collaborations between IG/FORTH, UiS and IFPEN that are expected to continue through joint publications and preparation of new research proposals. The submission of the DeepSEA and OPHyURE proposals provides tangible evidence that the collaborations initiated during TWINN2SET are already generating new research opportunities.

The project's stakeholder network will continue to be maintained through participation in European research initiatives, professional associations and collaborative events involving industry, public authorities and academic partners. Educational resources, including field guides, training material and mentoring approaches developed during the project, will also remain available to support future capacity-building activities. Specific attention will be given to the opportunities presented through the wider Advance D&E Academy on the exploitation of the decision-making tool for UHS site selection, and the widening of the existing network towards targeted stakeholders playing an important role in the respective market development and organisation of a hydrogen-based economy.

Building upon the dissemination framework established during the project's lifetime, a structured roadmap of activities has been defined for the period up to four years after the project completion (2026–2030). This roadmap aims to ensure the sustained visibility, uptake, and exploitation of TWINN2SET results, with a particular emphasis on stakeholder engagement, scientific dissemination, and regional impact. The planned activities include:

#### 1. Establishment of a conference on energy transition

The IG/FORTH will establish a **biennial international conference on “Geoenergy & Energy Transition”**, the 1<sup>st</sup> taking place in the new IG/FORTH premises in 2027. This event aims to position IG/FORTH as a regional hub for Geoenergy research, to promote knowledge exchange among academia, industry and stakeholders while ensure long-term visibility of TWINN2SET outcomes.

#### 2. Workshop on Hydrogen Innovation for Regional Growth-the Cretan case (2026)

In collaboration **with the Regional committee for Hydrogen in Crete**, IG/FORTH **plans to co-organize a targeted workshop** in the summer of 2026. This workshop aims to

- Strengthen the synergy with the ongoing TRIERES project
- Evaluate and support the development of Crete as a Hydrogen valley
- Explore the possibility of integrating TWINN2SET results into the regional energy transition plan (Presentation of TWINN2SET's decision-making tool).

#### 3. Participation in International and National Conferences

TWINN2SET's project results will continue to be disseminated through high-level scientific venues which will be sought at international and national level. Currently, participation with at least two presentations is scheduled for the 15<sup>th</sup> Panhellenic Scientific Conference on Chemical Engineering, 3-5 June 2026, Chania, Crete, Greece where TWINN2SET will be acknowledged.

#### 4. Capacity Building and Knowledge Transfer

In collaboration with the Technical University of Crete (TUC), IG/FORTH will continue the successful **co-organization of annual summer schools on Energy Transition** for the promotion of skills development and knowledge transfer to targeted audiences of students, early-career researchers and professionals, fostering the next generation of experts in the field.

#### 5. Public Engagement and Outreach

IG/FORTH will maintain an active presence in major public science and innovation events, including the annual Researcher's Night and InnoDays, to facilitate the promotion of public awareness on energy transition challenges and solutions, stimulate the discussion with citizens and local stakeholders, and enhance the societal impact of TWINN2SET results.

#### 6. Networking activities

IG/FORTH will actively pursue synergies with other EU-funded projects and initiatives at national level to maximise the long-term impact and exploitation potential of TWINN2SET's outcomes.

## 5.5 Exploring the commercialisation potential of KERs

The exploitation strategy developed during TWINN2SET extends beyond the project lifetime and focuses on ensuring that the project's KERs continue generating scientific, societal and economic value. The **decision-support tool for preliminary geological hydrogen storage site screening** represents the project's principal exploitable result and the only one with commercialisation potential. During the project, the methodology evolved from an internal research tool into a decision-support framework capable of assisting preliminary site assessment for underground hydrogen storage. Potential users include geological surveys, public authorities, research organisations, engineering consultants and industrial developers involved in subsurface energy storage planning. The methodology has already entered the **wider Advance Dissemination and Exploitation Academy**, where its exploitation pathway is being further developed.

This section focuses on the exploitation pathway of the primary KER beyond academia through communication to potential markets and end-users. In that context, major stakeholders affected or actively participating in National & European R&D & Energy planning and to Sustainable Energy Transition adaptation and implementation, have been identified with a special focus on hydrogen technologies.

Forty-four (44) stakeholders have been identified and contacted through the Coordinator (IG/FORTH) at national and European level:

### National stakeholders (35)

- *12 Public Organizations*
  - 3 Ministries (Ministry of Transport; Ministry of Education; Ministry of Energy & Environment)
  - 2 Directorate General (General Secretariat of Energy; General Secretariat of Research & Innovation)
  - 1 Regulatory Authority (RAE)
  - 2 Energy Agencies (Aegean Energy & Environment Agency; Hellenic Hydrocarbons and Energy Resources Management Company)
  - 2 Municipalities (Chania; Heraklion)
  - 2 Regional Governments (Region of Crete; Region of Western Macedonia)
- *3 Associations/NGOs* (CLUBE; Hellenic Association for Energy Economics; Institute of Energy for Southeast Europe)
- *10 Academic/Research Organizations* (CERTH; HCMR; NCSR DEMOKRITOS; EIE; University of Western Macedonia; Technical University of Crete; University of Crete, ELMEPA, NTUA; University of the Aegean)
- *2 Funds* (Hellenic Fund for Entrepreneurship and Development; uni.fund)
- *3 Project Consortia* (TRIERES; CRAVE-H2; H2SKILLS)
- *7 Enterprises/private companies* (HEREMA; MOTOROIL; HELLENIQ ENERGY; Terna Energy; PPC; TITAN; HELLENIC HYDROGEN)

### European level stakeholders (9):

- 4 European Commission Bodies (Clean Hydrogen partnership, Clean Energy, ENEA, REA, EDA)
- 1 European Association (Hydrogen Europe)
- 2 Austrian Organizations (Technical University of Graz, Green Energy Center)
- 2 UK academic organizations (University of Cardiff, Durham University)

Stakeholders' involvement will be promoted through the development of local, national, international and sectoral networking and bilateral meetings, under the supervision and support of the Coordinator and the Project's Exploitation Manager for the duration of the project and beyond. A **permanent consultation mechanism**, to discuss policies, practices and synergies with respect to hydrogen technologies and Energy Transition will be developed. and will include face-to-face consultations through bilateral meetings and consultation workshops.

The major stakeholders identified will be contacted during project implementation. The objective is to show these key actors the path to include/increase energy transition in their portfolio and to demonstrate the importance of these actions. The enrolment of stakeholders in TWINN2SET project is crucial for the success of the project results, because these are the actors that develop the technologies and build the infrastructures for energy storage and energy transition. These stakeholders have an important role in the respective market development and organization of energy storage and energy transition power system and the identification of barriers and ways to overcome them. Outreach activities aimed at each of the stakeholders are summarized in Table 9.

**Table 9.** Identified stakeholders and outreach activities towards the commercialisation of KERs.

| Stakeholder                                                                                                                                                           | Dissemination and exploitation activities envisaged towards the stakeholders                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Public bodies as regulatory bodies – policy makers, implementing legislation. Both incentive schemes and obligated construction rules will support the uptake of UHS. | <ul style="list-style-type: none"> <li>Dissemination to policy makers will be conducted with approval of the PSC and, when appropriate, in liaison with the REA PO. The main objectives are to create technology awareness, its related benefits for the environment and to stimulate actions for a successful market uptake</li> </ul>                          |
| Private investors actively seeking hydrogen solutions.                                                                                                                | <ul style="list-style-type: none"> <li>Dissemination campaign within professional groups and by PR articles in selected journals</li> </ul>                                                                                                                                                                                                                      |
| Research institutes further developing the technology and/or developing complementary research activities                                                             | <ul style="list-style-type: none"> <li>Disseminate results in scientific articles &amp; presentation in dedicated conferences</li> <li>Setting up and participating to dedicated scientific working groups</li> <li>Setting up new national and international research and innovation projects along with other research institutes and universities.</li> </ul> |
| Training institutes – associations providing training                                                                                                                 | <ul style="list-style-type: none"> <li>Development of guidebooks and videos and other recorded learning tools.</li> <li>Develop dedicated (online) training courses/webinars</li> <li>Organisation of workshops and seminars for professionals; Supporting master thesis topics jointly between academic and industrial partners</li> </ul>                      |
| Financial institutes                                                                                                                                                  | <ul style="list-style-type: none"> <li>Dedicated seminars informing financial institutes about TWINN2SET added value</li> </ul>                                                                                                                                                                                                                                  |
| End-users                                                                                                                                                             | <ul style="list-style-type: none"> <li>Dedicated information sessions informing end-users about TWINN2SET added value.</li> </ul>                                                                                                                                                                                                                                |
| Utility providers                                                                                                                                                     | <ul style="list-style-type: none"> <li>Dedicated seminars informing the utility providers about the added value the concept can bring.</li> </ul>                                                                                                                                                                                                                |

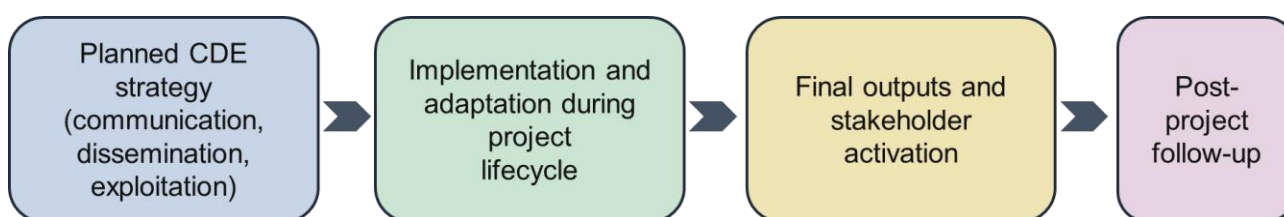
## 6 Critical assessment of the CDE outcomes

The TWINN2SET project successfully implemented and further refined its Communication, Dissemination and Exploitation (CDE) strategy in line with the approved planning and its final update. Across the project lifetime, WP5 transformed the original CDE plan into a dynamic and impact-oriented framework that combined scientific dissemination, public communication, stakeholder networking and early exploitation preparation. The final state of implementation shows that the project achieved broad visibility across scientific, policy, industrial and societal audiences, while also identifying a clear post-project pathway for sustaining selected results and partnerships.

The project delivered a comprehensive package of outputs that went beyond the original plan: a continuously updated website and social media presence; newsletters and digital communication material; scientific publications and conference participation; summer schools, field visits and workshops; citizen-engagement and public-outreach events; a final conference; and a progressively expanding stakeholder network. The final CDE implementation also linked

dissemination more closely with exploitation by identifying the decision-making tool for underground hydrogen storage site screening as the project's main Key Exploitable Result, while the HPHT/HTHP laboratory specification created an additional infrastructure-oriented result with long-term value for FORTH/IG.

During implementation, several improvements were introduced to maximise impact. Citizen engagement expanded beyond the minimum originally foreseen and evolved into a broader portfolio of science-communication, public-dialogue and policy-facing actions. Cross-project synergies were also strengthened through bilateral meetings, Memoranda of Understanding and collaboration with other national and European initiatives. In parallel, the project increased its emphasis on policy relevance, regional hydrogen-related dialogue, and stakeholder consultation mechanisms. These adaptations made the final strategy more outward-looking, inclusive and better connected to real-world uptake pathways.



**Figure 20.** Evolution of the TWINN2SET CDE strategy from approved plan to post-project follow-up.

**Table 10.** Final state of the dissemination, communication and exploitation strategy

| Dimension                          | Planned approach                                                                                               | Final achievements                                                                                                                                                     | Remarks / changes introduced                                                                                                                                 |
|------------------------------------|----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Communication                      | Website, social media, newsletters, visual identity, videos and local press actions.                           | Website and social media channels operated throughout the project; newsletters and communication material produced; regular promotion of events and outputs.           | Minor adjustments were made to delivery formats and timing, but the communication portfolio remained active and visible throughout implementation.           |
| Scientific dissemination           | Publications, conference participation, technical workshops, Summer Schools and final conference.              | 7 peer-reviewed publications (plus 4 in preparation), conference presentations, summer schools, 3 field visits, workshops and final conference successfully delivered. | Scientific dissemination was progressively linked with training and networking, increasing the overall value of each activity.                               |
| Citizen and stakeholder engagement | Workshops with non-academic actors and broader awareness-raising activities.                                   | Citizen-engagement events, Researchers' Night, exhibitions, fairs, public-facing conference actions and bilateral stakeholder meetings were implemented.               | This dimension expanded significantly beyond the initial plan and became one of the strongest features of the project.                                       |
| Exploitation                       | Early identification of exploitable results, stakeholder outreach and potential market/end-user communication. | Decision-support tool for underground hydrogen storage identified as main KER; stakeholder network developed; bilateral consultations and follow-up                    | Exploitation evolved from a relatively general plan into a more concrete framework linked to hydrogen storage applications, consultancy potential and future |

|                            |                                                                                   |                                                                                                                                                               |                                                                                                                                       |
|----------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
|                            |                                                                                   | collaboration routes activated.                                                                                                                               | proposals. Facilitation of the exploitation of the main KER through the widerAdvance D&E academy.                                     |
| Sustainability / follow-up | Support impact beyond project end through networking and continued dissemination. | A four-year post-project roadmap, durable stakeholder links, research-strategy follow-up and participation in new proposal and demo initiatives were defined. | The final strategy clearly frames project closure as a transition toward continued institutional positioning rather than an endpoint. |